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# Soil pH and Plant Population Effects on Soybean Yield

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**Abstract**
Liming soils is an important part of the overall fertility program for soybean production. The decision of whether or not lime is needed is generally based on the soil pH. Soybeans are adversely affected by acidity when the pH falls below about 5.8. Considerable interest exists in Iowa about soil pH specific management recommendations. Because soil pH varies across Iowa, it is likely that the current optimum plant population for soybeans needs to be adjusted depending on soil pH. The objective of this study is to identify the optimum plant population for soybeans at various levels of soil pH.

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Agricultural Science | Agriculture | Agronomy and Crop Sciences

# Soil pH and Plant Population Effects on Soybean Yield

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## Introduction

Liming soils is an important part of the overall fertility program for soybean production. The decision of whether or not lime is needed is generally based on the soil pH. Soybeans are adversely affected by acidity when the pH falls below about 5.8. Considerable interest exists in Iowa about soil pH specific management recommendations. Because soil pH varies across Iowa, it is likely that the current optimum plant population for soybeans needs to be adjusted depending on soil pH. The objective of this study is to identify the optimum plant population for soybeans at various levels of soil pH.

## Materials and Methods

The experiment was a randomized complete block in a split plot arrangement with four replications. Main plots were 5 lime treatments (0, 1.7, 5, 15, and 45 tons aglime/acre) applied in 1995. Soil pH for the different treatments were, on the average, 5.4, 6.0, 6.5, 7.1, and 7.8. Continuous corn had been grown in the field since 1995. The sub-plots consisted of five seeding rates (75,000, 125,000, 175,000, 225,000, and 275,000 plants/acre). Plot size of the sub-plot experimental units was 10 ft × 37.5 ft, and 5 ft × 32.5 ft was used for harvest. The soybean variety was Pioneer 92M80 planted on May 22 with a John Deere MaxEmerge planter. Seed was inoculated with *Bradyrhizobium japonicum* (Liphatech, Milwaukee, WI), and each plot was planted in four rows at 30-inch row spacing and 1-inch depth.

Plots were harvested September 25 with an Almaco small-plot combine. Grain yields were adjusted to 13% moisture. Reported yields are shown in Table 1.

## Results and Discussion

Summarized in Table 1 are the results of the study. No differences were found among lime treatments and soil pH on soybean yield, grain moisture, height or lodging. Grain yield was least for the lowest plant population (67,800 plants/acre). However, no differences were found among the remaining 4 plant populations. Grain moisture decreased as plant population increased whereas plant height increased as plant population increased. Plant population did not influence plant lodging.

It was concluded that soil pH did not influence the optimum plant population based on the first year of data. The study will be continued in 2004.

## Acknowledgments

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**Table 1. Effect of soil pH and final plant population on soybean yield, moisture, height, and lodging.**

| Main effect | Yield | Moisture | Height | Lodging |
|---|---|---|---|---|
| | Bu/acre | Percent | Inch | 1–5† |
| Lime (L), tons aglime/acre‡ | | | | |
| 0 | 39.0 | 9.7 | 25.0 | 1 |
| 1.7 | 40.0 | 9.6 | 24.8 | 1 |
| 5 | 39.7 | 9.8 | 24.2 | 1 |
| 15 | 39.7 | 9.8 | 24.2 | 1 |
| 45 | 40.0 | 9.6 | 24.4 | 1 |
| LSD (0.05) | NS¶ | NS | NS | NS |
| Final plant population (P), plants/acre | | | | |
| 67,800 | 38.0 | 9.9 | 23.6 | 1 |
| 106,600 | 40.1 | 10.0 | 24.4 | 1 |
| 146,700 | 39.8 | 9.5 | 24.8 | 1 |
| 186,400 | 40.2 | 9.5 | 24.9 | 1 |
| 200,100 | 40.8 | 9.7 | 25.0 | 1 |
| LSD (0.05) | 1.5 | 0.2 | 0.8 | NS |
| Anova | | | | |
| L*P | NS | NS | NS | NS |

†Lodging score: the range extends from 1 = erect to 5 = flat.
‡Soil pH for the different lime treatments: 0 (pH 5.4), 1.7 (pH 6.0), 5 (pH 6.5), 15 (pH 7.1), and 45 (pH 7.8).
¶NS, not significant at $P \leq 0.05$.